CLAIMS

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What is claimed is:

1. An apparatus for electrically testing a work piece having a plurality of electrically conductive contact locations thereon comprising:

a substrate having a first surface and a second surface;

a plurality of first electrical contact locations on said first side;

a plurality of probe tips disposed on said first contact locations;

each of said probe tips having an elongated electrically conductive member projecting from an enlarged base, said base being disposed on said contact locations;

means for moving said substrate towards said work piece so that said plurality of probe tips are pressed into contact with said plurality of contact locations on said work piece.

2. An apparatus according to claim 1 wherein said probe tip is formed from a material selected from the group consisting of Cu, Au, Al, Pd and Pt, and their alloys.

3. An apparatus according to claim 2 wherein said probe tip has at least one coating selected from the group consisting of Pt, Ir, Rh, Ru, Pd, Cr, Ti, TiN, Zr, ZrN and Co.

4. An apparatus according to claim 2 wherein said protuberance has a first coating selected from the group consisting of Cr, Ti, TiN, Ni, Zr, ZrN or Co and a second coating over said first coating selected from the group consisting of Pt, Ir, Rh, Ru and Pd.

5. An apparatus according to claim 1, wherein said substrate further includes a decoupling capacitor.

6. An apparatus according to claim 1, wherein said elongated member has a flattened end.

7. An apparatus according to claim 1 wherein said second surface has a plurality of second electrical contact locations thereon.

8. An apparatus according to claim 1, wherein said second contact locations have an elongated electrical conductor attached thereto.

9. An apparatus according to claim 1 wherein said substrate has electrical conductor patterns extending from said first surface to said second surface.

10. An apparatus according to claim 1, further including a sheet of material having a plurality of openings, said opening being positioned to align with said plurality

of probe tips, said sheet is disposed over said plurality of probe tips, said elongated electrically conductive members being disposed in said opening.

11. An apparatus according to claim 10 wherein said elongated electrically conductive member has a first end disposed in contact with said enlarged base and a second end disposed in contact with an enlarged tip.

12. An apparatus according to claim 10 wherein said sheet is disposed between said enlarged base and said enlarged tip.

13. An apparatus according to claim 10, further including a layer of material disposed on said sheet, said layer having openings aligned with said probe tips.

14. An apparatus according to claim 13, wherein openings in said layer are larger than said probe tip.

15. An apparatus according to claim 14, wherein said contact locations on said work piece are ball-shaped and wherein said openings in said layer are adapted to receive said contact location on said work piece having said ball shape.

16. A structure comprising:

a substrate having a surface;

a plurality of electrically conductive members disposed on said surface;

said electrically conductive members have an enlarged base, an elongated electrically conductive member in contact with said base and extending away from said base;

a sheet of material having a plurality of openings disposed for alignment with said plurality of electrically conductive members;

said sheet is disposed over said plurality of electrically conductive members with said elongated electrically conductive member extending through said plurality of openings.

17. An apparatus according to claim 16 wherein said elongated electrically conductive member has a first end disposed in contact with said enlarged base and a second end disposed in contact with an enlarged tip.

18. An apparatus according to claim 16 wherein said sheet is disposed between said enlarged base and said enlarged tip.

19. An apparatus according to claim 16, further including a layer of material disposed on said sheet, said layer having openings aligned with said probe tips.

20. An apparatus according to claim 19, wherein openings in said layer are larger than said probe tip.

21. An apparatus according to claim 20, wherein said contact locations on said work piece are ball-shaped and wherein said openings in said layer are adapted to receive said contact location on said work piece having said ball shape.

22. A structure according to claim 16 wherein said structure is an apparatus for electrically testing a work piece having a plurality of electrically conductive contact locations thereon.

23. A structure comprising:

a substrate having a surface;

a plurality of electrically conductive members disposed on said surface;

said electrically conductive members have an elongated base, an elongated electrically conductive member in contact with said base and having an end extending away from said base;

said end being enlarged.

24. A method comprising the steps of:

providing a substrate having a surface;

bonding an elongated electrical conductor to said surface by forming a ball bond at said surface;

shearing said elongated conductor from said ball bond leaving an exposed end of said elongated conductor;

flattening said exposed end.

25. A method according to claim 24, further including the steps of:

providing a sheet of material having an opening therein;

disposing said sheet with respect to said surface so that said elongated conductor extends within said opening.

26. A method according to claim 25, further including disposing on said sheet a layer of material having an opening therein through which said elongated electrically conductive member is exposed.

27. A method according to claim 24, further including the step of moving said substrate towards a work piece so that said plurality of elongated electrical conductors are placed into electrical contact with a plurality of electrical conductors on a work piece.

28. A method according to claim 24 wherein said elongated electrical conductor is formed from a material selected from the group consisting of Cu, Au, Al, Pd and Pt, and their alloys.

29. A method according to claim 28 further including disposing said exposed end at least one coating selected from the group consisting of Pt, Ir, Rh, Ru, Pd, Dr, Ti, TiN, Zr, ZrN and Co.

30 A method according to claim 28 further including disposing on said exposed end a first coating selected from the group consisting of Cr, Ti, TiN, Ni, Zr, ZrN or Co and disposing a second coating over said first coating selected from the group consisting of Pt, Ir, Rh, Ru and Pd.

31. A method according to claim 24 further including disposing on said substrate a decoupling capacitor.

32. A method according to claim 24 wherein said elongated electrical conductors are ball bonded to electrical contact locations on said surface.

33. A method according to claim 24 wherein said substrate has another surface having a plurality of electrical contact locations thereon.

34. A method according to claim 33 wherein said contact locations on said another surface have elongated electrical conductor attached thereto.

35. A method according to claim 24 wherein said substrate has electrical conductor patterns therein.

36. An apparatus for making electrical contact with a plurality of solder balls on an integrated circuit device comprising:

36-43
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a first fan out substrate having a first surface; said first surface having a plurality of contact locations; a plurality of ball bonds attached to said plurality of contact locations; a plurality of short studs extending outward from said ball bonds, away from said first surface on fan out substrate.

37. An apparatus according to claim 36, further including an enlarged contact surface at the end of said studs.

38. An apparatus according to claim 36, wherein said plurality of ball bonds and short studs are surrounded by a layer of polymer material.

39. An apparatus according to claim 38, wherein said polymer material has a coefficient of thermal expansion that is matched to the first fan out substrate and has a glass transition temperature greater than 200C.

40. An apparatus according to claim 37, wherein said enlarged contact surface has a first metal layer deposited to inhibit oxidation and diffusion of the interface at temperatures up to 200C; said first metal layer includes a material selected from the group consisting of Pt, Ir, Rh, Ru and Pd.

41. An apparatus according to claim 41, wherein a second layer of metal is used between said enlarged contact surface and said first metal layer to prevent out-diffusion of the underlying material; said second metal layer includes a material selected from the group consisting of to TiN, Cr, Ni, and Co.

42. An apparatus according to claim 39, wherein said fan out substrate is selected from the group consisting of multilayer ceramic substrates with thick film wiring; multilayer ceramic substrates with thin film wiring; metallized ceramic substrates with thin film wiring; epoxy glass laminate substrates with copper wiring; and, silicon substrates with thin film wiring

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43. An apparatus according to claim 38, wherein a second layer of polymer material with enlarged holes corresponding to the said plurality of contact locations is placed over said first layer of polymer material and aligned with said enlarged contact surfaces to form a cup shaped geometry.

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